

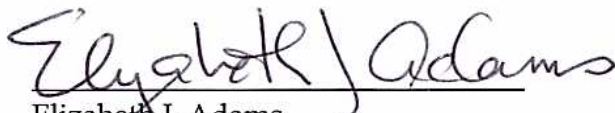
THIRD FIVE-YEAR REVIEW REPORT
FOR
STRINGFELLOW SUPERFUND SITE
RIVERSIDE COUNTY, CALIFORNIA

September 2006

United States Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, California 94105

Approved by:

Date:


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September 19, 2006

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Acronyms

µg/L	micrograms per liter
ARAR	applicable or relevant and appropriate requirement
CAA	Clean Air Act
CAG	County Association of Governments
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CWTS	Community Wellhead Treatment System
DDT	dichloro-diphenyl-trichloroethane
DTSC	California Department of Toxic Substances Control
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Differences
FS	Feasibility Study
GAC	granular activated carbon
gpd	gallons per day
HHRA	human health risk assessment
IC	institutional control
IPRS	Interim Pesticide Removal System
LCTF	Lower Canyon Treatment Facility
LUC	Land Use Covenant
MCL	Maximum Contaminant Level
MG	million gallons
MSL	mean sea level
MW	monitoring well
NA	Not Applicable
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDMA	n-nitrosodimethylamine

NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	operations and maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
p-CBSA	para-chlorobenzene sulfonic acid
PCB	polychlorinated biphenyl
POTW	publicly owned treatment works
ppb	parts per billion
PRG	preliminary remediation goal
PRP	potentially responsible party
PRS	Pesticide Removal System
PTE	potential to emit
PTP	Pretreatment Plant
RAO	remedial action objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARI	Santa Ana Regional Interceptor
SCAQMD	South Coast Air Quality Management District
SFS	Supplemental Feasibility Study
SOCAB	South Coast Air Basin
SVE	soil vapor extraction
TBC	to be considered
TBD	to be determined
TCE	trichloroethylene
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
Water Board	California Regional Water Quality Control Board

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name: Stringfellow Superfund Site

USEPA ID: CAT080012826 **CERCLIS ID :** 0901

Region: 9 **State:** CA **City/County:** Glen Avon/Riverside County

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify) _____

Remediation status (choose all that apply): ☒ Operating ☐ Complete

Multiple OUs? ☒ YES ☐ NO **Construction completion date:** Construction not complete.

Has site been put into reuse? ☐ YES ☒ NO

REVIEW STATUS

Reviewing agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Charnjit Bhullar

Author title: Remedial Project Manager **Author affiliation:** USEPA Region 9

Review period: March through August 2006

Date(s) of site inspection: April 10-11, 2006

Type of review: ☒ Statutory
☐ Policy ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion)

Review number: ☐ 1 (first) ☐ 2 (second) ☒ 3 (third) ☐ Other (specify)

Triggering action:

☐ Actual RA Onsite Construction at the Waste Pits OU

☐ Actual RA

☒ Previous Five-Year Review Report

☐ Construction Completion

☐ Other (specify) _____

Triggering action date: September 27, 2001

o Other (specify) _____

Triggering action date: September 27, 2001

Due date (five years after triggering action date): September 27, 2006

Issues and Recommendations:

Issue – Zones 1, 2, 3, and 4

Additional contaminants of concern (COCs) (perchlorate, pesticides, 1,4-dioxane, n-nitrosodimethylamine) have been identified in groundwater since the remedies for Zones 1 through 4 were selected.

Recommendation – Zones 1, 2, 3, and 4

While groundwater monitoring and other site characterization activities are currently underway to address the new COCs, further characterization is required to identify trends in concentrations in groundwater over time and to ensure that the existing extraction systems provide for adequate capture of new COCs. Pilot studies and evaluations to support the design of the new pretreatment plant (PTP) to treat these contaminants should continue. Remedial investigation/feasibility study (RI/FS) activities, including soil and groundwater characterization, risk assessments, and evaluation of remedial alternatives, should continue to support the selection of a final remedy to address perchlorate in groundwater in Zone 4. Remedies for the new COCs will be selected in future decision documents, which include a fourth record of decision (ROD) amendment (expected in 2008) and a fifth ROD (expected in 2009).

Issue – Zones 1, 2, and 4

Institutional controls (IC) are inadequate to ensure future receptors are not exposed to contaminants in soil and groundwater at the site.

Recommendation – Zones 1, 2, and 4

While controls are currently in place in Zone 4 to reduce the potential for exposure of residents to contamination in groundwater, ICs should be included as part of the remedy selected in a future decision document to prevent disturbance of soil in the original disposal area in Zone 1, to prevent buildings from being constructed in Zones 1 and 2, and to further prevent unauthorized uses of groundwater in the Glen Avon community area in Zone 4. In addition, the 1986 plume boundary map currently used by the Riverside Department of Environmental Health for well permit applications in Zone 4 should be updated based on current plume boundary information to facilitate future well permitting decisions.

Issue – Zones 1, 2, 3, and 4

The 2005 ERA identified the need for additional data to verify the conclusions of the *Final Screening-Level Ecological Risk Assessment* (CH2M HILL, 2005). Specifically, the ERA recommended that an evaluation of background metal concentrations be performed to clarify whether metals in soil at the site pose a significant risk to ecological receptors, that plant samples

be collected for plants that serve as forage for wildlife to evaluate perchlorate doses to herbivorous receptors, and that evaluations on the distribution of perchlorate and para-CBSA continue to support future evaluations of the risks these analytes pose to ecological receptors.

Recommendation – Zones 1, 2, 3, and 4

Additional data should be collected as recommended in the *Final Screening-Level Ecological Risk Assessment* (CH2M HILL, 2005) to verify the conclusions of the ERA. These data should be collected so that they may be included in the fifth ROD, which is scheduled to be issued in December 2009.

Issue - Zones 2 and 3

Although decreasing contaminant concentrations suggest that the existing extraction systems in Zones 2 and 3 prevent contaminant migration to downgradient areas, modeling studies have shown that the existing groundwater extraction systems in Zones 2 and 3 may not efficiently intercept and capture site-related contaminants in deeper flow channels and weathered bedrock units.

Recommendation – Zones 2 and 3

The effectiveness of the existing extraction systems in Zones 2 and 3 should be evaluated to identify the need for system upgrades and/or system optimization. The extraction systems should be upgraded/optimized as determined to be necessary through this evaluation. System optimization and upgrades will be performed as part of the operations and maintenance (O&M) program included in the amendment to the fourth ROD.

Site-wide Protectiveness Statement

The remedy for the Stringfellow Superfund Site is expected to be protective of human health and the environment upon completion and, in the interim, exposure pathways that could result in unacceptable risks are being controlled. The final remedy for the site should be implemented to ensure long-term protectiveness.

Executive Summary

This five-year review report assesses the protectiveness of the remedial actions implemented at the Stringfellow Hazardous Waste Site in Riverside County, California. This is the third five-year review for the Stringfellow site. The United States Environmental Protection Agency (USEPA) conducted an initial five-year review in February 1993 and a second five-year review was completed in September 2001.

The Stringfellow Superfund site is located near the community of Glen Avon in Riverside County, California. The original 17-acre site (Zone 1) is located in Pyrite Canyon in the Jurupa Mountains at the head of Pyrite Creek. During the period from 1956 to 1972, more than 34 million gallons (MG) of liquid industrial waste, primarily from metal finishing, electroplating, and pesticide production, were deposited in approximately 20 unlined evaporation ponds in Zone 1 (USEPA, 1983).

Soils in the original disposal area are contaminated with pesticides, polychlorinated biphenyls (PCBs), sulfates, and heavy metals. Groundwater at the site contains various volatile organic compounds (VOCs), pesticides, perchlorate, n-nitrosodimethylamine, and heavy metals. Groundwater contamination from the site extends approximately 4 miles south to the Santa Ana River. The area downgradient of Zone 1 is evaluated as three separate zones – Zones 2, 3, and 4.

Exposure to the site contaminants poses potential significant human health risks to current and future receptors. Therefore, remedial action was determined to be warranted. Initial remedial actions began after excessive rainfall caused the disposal ponds to overflow and contaminate Pyrite Creek and Channel in 1969. The site was placed on the National Priorities List in 1983 (Environ, 2000).

Four Record of Decision (ROD) documents direct the remedial actions for the site. The first ROD directed completion of several initial abatement activities, including fencing, erosion control, interim source control, and offsite hauling and disposal of contaminated liquids. The second ROD selected construction of an onsite pretreatment plant (PTP) to treat contaminated groundwater, and included installation of an expanded extraction system in Zone 2. The third ROD selected installation of a groundwater barrier system in Zone 3, and installation of peripheral surface channels to direct upgradient surface water runoff. The fourth ROD selected dewatering in Zone 1, installation of a groundwater extraction system in Zone 4, field testing of soil vapor extraction, and field testing of reinjection of treated groundwater in the upper canyon area.

This five-year review has determined that the remedy for the site is expected to be protective of human health and the environment upon completion and, in the interim, exposure pathways that could result in unacceptable risks are being controlled. The final remedy for the site should be implemented to ensure long-term protectiveness.

1.0 Introduction

The purpose of the five-year review process is to evaluate whether the remedial measures implemented at the site are protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and provide recommendations for addressing them.

By statute, the USEPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c), as amended, which states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with Section [104] or [106], the President shall take or require such action. The President shall report to Congress a list of facilities for which such review is required, the results of all such reviews, and any action taken as a result of such reviews.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

Consequently, this five-year review was undertaken because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unrestricted use and unlimited exposure.

The United States Environmental Protection Agency (USEPA) Region 9 has conducted a five-year review of the remedial actions implemented at the Stringfellow Hazardous Waste Site (also referred to as “site”), located in Riverside County, California, approximately 50 miles east of Los Angeles. This review was conducted during March through August 2006. CH2M HILL was contracted under USEPA Region 9’s Response Action Contract to prepare this report under USEPA’s direction to document the results of the five-year review.

This is the third five-year review for the site. The USEPA conducted an initial five-year review in February 1993. No deficiencies were noted at that time. A second five-year review was completed in September 2001. The second five-year review identified several deficiencies at the site, as summarized in this report. The triggering action for this statutory review is the completion date of the second five-year review, which is September 27, 2001.

This report addresses the following zones at the site:

- Zone 1 – Onsite/Upper-Mid Canyon Area
- Zone 2 – Mid-Canyon Area
- Zone 3 – Lower Canyon Area
- Zone 4 – Glen Avon Community

The name, description, applicable zone, and status of each operable unit (OU) at the site are identified in Table 1-1. The scope of each OU is based on the scope of the record of decision (ROD) documents that have been recorded for the site.

TABLE 1-1

Operable Units at Stringfellow Superfund Site

Third Five-Year Review Report, Stringfellow Superfund Site, Riverside County, California

Operable Unit	OU Name	OU Description	Zone	Status
00	Site Evaluation	Preremedial and emergency response.	1	Construction complete.
01	Source Control/Interim Abatement	First ROD.	1	First ROD issued July 22, 1983. Construction complete.
02	Pretreatment Plant (PTP)	Second ROD.	1, 2	Second ROD issued July 18, 1984. Construction complete.
03	Lower Canyon	Third ROD.	1, 3	Third ROD issued June 25, 1987. Construction complete.
04	Dewatering/Community Wells	Fourth ROD.	1, 2, 3, 4	Fourth ROD issued September 30, 1990. Construction complete.
05	Final Remedy	Final remedy for all zones.	1, 2, 3, 4	Evaluations to support selection of final remedy underway.

2.0 Site Chronology

The chronology of key events for the site is provided in Table 2-1. The State of California regulatory agencies, which have been involved with response and cleanup activities at this site, include the California Regional Water Quality Control Board (Water Board) and the California Department of Health Services, Toxic Substances Control Division (now known as the California Environmental Protection Agency, Department of Toxic Substances Control [DTSC]). In 1981, DTSC became the primary responsible party for the site and is conducting the investigation, cleanup, and operations and maintenance (O&M) actions at the site. The USEPA is the oversight agency.

TABLE 2-1
Chronology of Events
Third Five-Year Review Report, Stringfellow Superfund Site, Riverside County, California

Date	Event
August 1956	Hazardous waste disposal operations at Stringfellow commenced.
1969	Excessive rainfall leads to overflow of the former disposal ponds.
February 1972	Site contaminants first detected in groundwater downgradient of waste disposal area.
November 1972	Hazardous waste disposal operations at Stringfellow site ceased.
1975	Water Board initiates response actions and studies.
November 1978	Controlled release of contaminated water to Pyrite Creek; discharge supervised by Water Board.
1978 - 1981	Water Board removed 6.5 MG of contaminated water and dichloro-diphenyl-trichloroethane (DDT)-contaminated soil.
1980	USEPA performed initial site inspection. 10 MG of contaminated water removed; containment barriers were installed and surface drainage improvements were made.
December 1980	Water Board adopted Interim Abatement Program.
October 1981	Stringfellow site placed on the USEPA Interim Priorities List of Hazardous Waste Sites.
1981	California Department of Health Services began the investigation and cleanup at the site.
July 22, 1983	USEPA issued first ROD (addressed Zones 1 through 4).
September 8, 1983	Stringfellow site placed on USEPA National Priorities List (NPL).
1983-1984	"Fast-track" Remedial Investigation/Feasibility Study (RI/FS) conducted by USEPA.
July 18, 1984	USEPA issued second ROD (addressed Zones 1 and 2).
September 18, 1984	Start of remedial design for Zone 2 groundwater extraction system.
October 23, 1984	Completion of remedial design for Zone 2 groundwater extraction system.
November 29, 1984	Start of remedial action for Zone 2 groundwater extraction system.
November 15, 1985	Completion of remedial action for Zone 2 groundwater extraction system.

TABLE 2-1
Chronology of Events
Third Five-Year Review Report, Stringfellow Superfund Site, Riverside County, California

Date	Event
1985	Onsite PTP startup in Zone 2.
June 1987	Draft RI Report released for public comment.
June 25, 1987	USEPA issued third ROD (addressed Zones 1 and 3).
September 30, 1987	Start of remedial design for Zone 3 groundwater extraction system.
May 1988	Potentially responsible parties (PRP) agreed to construct certain of the third ROD remedial actions in an Administrative Order on Consent.
June 1988	Draft Final FS Report issued.
June 1988	USEPA and DTSC issued Proposed Plan to address Zone 4 groundwater contamination.
August 31, 1988	Completion of remedial design for Zone 3 groundwater extraction system.
February 1989	USEPA and DTSC issued second Proposed Plan (included long-term continuation of downgradient plume management activities for Zones 2 through 4, and for Zone 1, dewatering coupled with soil vapor extraction [SVE] and installation of an improved cap).
March 2, 1989	Start of long-term response action for Zone 1.
March 2, 1989	Start of remedial action for Zone 3 groundwater extraction system.
April 5, 1990	Completion of remedial action for Zone 3 groundwater extraction system.
July 25, 1990	Start of remedial design for Zone 4 groundwater extraction system.
September 30, 1990	USEPA issued fourth ROD (addressed Zones 1 through 4).
February 10, 1993	USEPA issued first five-year review report.
September 23, 1993	Start of remedial action for Zone 4 groundwater extraction system.
January 3, 1995	Completion of remedial action for Zone 4 groundwater extraction system.
1995	Construction completed on Zone 1 dewatering system (fourth ROD).
July 1998	Explanation of Significant Differences (ESD) issued for the second ROD for construction of an effluent pipeline between the PTP and the Santa Ana Regional Interceptor (SARI) pipeline.
October 1998	Construction of effluent pipeline extending to SARI pipeline complete.
1998	Construction completed on additional components to Zone 4 extraction system.
1998	DTSC performed additional Zone 4 investigation.
1998-2000	DTSC performed additional field investigations in Zones 1 through 3.
October 1999	Groundwater extraction system in Zone 1 expanded.
April 2000	DTSC issued Draft Supplemental Feasibility Study (SFS) Report for Zones 1 through 4.
April - May 2001	DTSC detected perchlorate at site and began perchlorate investigation in Zone 4.
June 2001	Volatile Organic Compound (VOC) emissions recovery systems installed at the PTP in Zone 2 for A-Stream storage tanks.

TABLE 2-1
Chronology of Events
Third Five-Year Review Report, Stringfellow Superfund Site, Riverside County, California

Date	Event
September 2001	USEPA issued Second Five-year Review Report.
January-March 2002	Installation of 28 new monitoring wells in Zone 3.
March 2002	Phase I audit conducted for historical uses of perchlorate in Glen Avon area in Zone 4.
2002	All residents with private wells in Zone 4 were connected to the public water supply. The private wells were converted for irrigation uses only.
October 2002 - present	Additional characterization performed to identify the nature and extent of perchlorate in Zone 4.
October 2002 – January 2003	Soil sampling in Zone 1 and along Pyrite Creek.
June 2003	DTSC detected perchlorate in water supply wells east of site.
April 2003	DTSC installed 18 new monitoring wells in Zone 4.
Fall 2003 through Winter 2004	DTSC installed 9 new monitoring wells in Zone 4.
October 2003	Interim Pesticide Removal System (IPRS) installed at PTP in Zone 2.
December 2003	DTSC amended the Community Wellhead Treatment System (CWTS) with resin beds to treat perchlorate contaminated influent from Zone 4.
2005	Permanent Pesticide Removal System (PRS) installed at PTP in Zone 2.
January – March 2005	DTSC performed surface water monitoring along the surface discharge channel and Pyrite Creek.
August 2005	DTSC completed seismic reflection survey for Zone 4 and cone penetrometer testing.
February – April 2006	DTSC performed surface water monitoring along the surface discharge channel and Pyrite Creek.

3.0 Site Background

3.1 Physical Characteristics

This section presents a summary of physical characteristics for Stringfellow, including a description of the site, surface features, geology, and hydrogeology.

3.1.1 Site Description

The site is located near the community of Glen Avon, in Riverside County, California, approximately 4,500 feet north of the intersection of U.S. Highway 60 and Pyrite Street (Figure 1). The original 17-acre site (Zone 1) is located in Pyrite Canyon in the Jurupa Mountains at the head of Pyrite Creek. As a result of previous activities at Zone 1 and subsequent migration of contaminants in groundwater, groundwater contamination from the site extends approximately 4 miles south to the Santa Ana River. The area downgradient of Zone 1 is evaluated as three separate zones – Zones 2, 3, and 4 (Figure 2).

3.1.2 Surface Features

Pyrite Canyon is bordered by undeveloped steep canyon walls that reach a height of 2,217 feet mean sea level (msl). The floor of the canyon descends from an elevation of 1,125 to 1,025 feet msl at a clay barrier dam at the southern end of Zone 1, and to 840 feet msl outside the mouth of the canyon around U.S. Highway 60. The width of Pyrite Canyon is 750 feet at the dam, and 2,500 at the canyon mouth near the southern end of Zone 3 (ENVIRON, 2000).

The Pyrite Creek watershed covers approximately 270 acres (USEPA, 1983). Intermittent stream flow in Pyrite Creek occurs as a result of intense rainfall events. Natural surface water flow in the canyon has been altered due to the construction of the former disposal ponds and surface water channels directing flow. Surface water that drains from the canyon walls upstream of the site and from Zone 1 collects into a surface water drainage channel that borders the site (Figure 3) (Environ, 2000). Surface water that collects in the channel either discharges into Pyrite Creek or infiltrates into exposed soil in portions of the drainage channel that are not lined with concrete.

3.1.3 Geology

Pyrite Canyon is underlain by three geologic units: (1) fill/alluvium, (2) weathered/decomposed granitic bedrock, and (3) unweathered, fractured granitic bedrock (CH2M HILL, 2001). In general, the alluvium and fill material is found at the surface and beneath lies the weathered and unweathered bedrock. The depth of each geologic unit varies within the canyon. The fill/alluvium unit extends to its greatest depth (100 feet) along the eastern side of the canyon in the area south of Highway 60, which is believed to be a former channel. The weathered bedrock is also the deepest, and thickest, under the former channel and forms a “trough” shape (Environ, 2000). Weathered bedrock varies in fragment and particle size due to the amount of weathering. The top of the weathered bedrock is at or near the surface in the sidewalls of the canyon (Environ, 2000). Unweathered bedrock

beneath the weathered bedrock also forms a “trough” shape along the eastern side of the canyon. Depth to the unweathered bedrock in the trough is 150 feet and greater. Downgradient, the structure of the underlying geologic units is approximately the same, with varying depths to each unit (Environ, 2000).

3.1.4 Hydrogeology

Groundwater originates from groundwater upstream of the site and canyon sidewalls. Surface water from the northwest face of the canyon and Mount Jurupa also contribute to the groundwater beneath the site. Contribution due to infiltration is negligible in years with little rainfall due to the high evapotranspiration rate. Depth to groundwater varies within the canyon (Environ, 2000). Groundwater is found in all three underlying hydrostratigraphic units (alluvium, weathered bedrock, and unweathered bedrock). These units are capable of storing and transmitting varying amounts of groundwater (CH2M HILL, 2001). In the unweathered bedrock, groundwater flow occurs only in the fractures. As groundwater flows south out of the canyon, it enters the regional groundwater system under the Glen Avon community, and then continues to the southwest.

3.2 Land and Resource Use

From 1956 until 1972, the site operated as a Class 1 hazardous waste disposal site (USEPA, 1983). The land of the original site remains undeveloped, and is largely used to support treatment and O&M activities associated with remedy for the site.

Land use surrounding the site is limited to several commercial developments south of the site (Zones 3 and 4). The canyon walls east and west of the site are undeveloped (Environ, 2000). Land north of the site (on the other side of the Jurupa Mountain Range) has been developed for residential purposes. The residential community of Glen Avon, which is approximately 4,500 feet southwest of the former disposal ponds, historically used groundwater as a source of drinking water. The groundwater was pumped through numerous private wells. Residents of Glen Avon are currently connected to a public water supply and no longer use the private wells as a source of drinking water.

3.3 History of Contamination

During operation as a hazardous waste disposal site from 1956 to 1972, more than 34 MG of liquid industrial waste, primarily from metal finishing, electroplating, and pesticide production, were deposited in approximately 20 unlined evaporation ponds in Zone 1. Spray evaporation procedures were used to decrease the volume of wastes in the ponds. Evaporation ponds covered a total of 3.5 acres and an additional 5.6 acres were contaminated from aeration (USEPA, 1983).

In 1969, excessive rainfall caused the disposal ponds to overflow and resulted in the contamination of Pyrite Creek and Channel. The Water Board directed several measures (for example, construction of earthen berms, a collection sump, and a waste liquid return system) to prevent another surface water discharge. In 1972, groundwater samples collected from a monitoring well in Zone 3 were found to be contaminated. Stringfellow Quarry Company, Inc. voluntarily closed the site in November 1972 (Environ, 2000).

Groundwater at the site contains VOCs, pesticides, perchlorate, n-nitrosodimethylamine (NDMA), and heavy metals such as cadmium, nickel, chromium, and manganese. Soils in the original disposal area are contaminated with pesticides, PCBs, sulfates, and heavy metals. The original disposal area is now covered by a clay cap and an erosion-control vegetation surface (Environ, 2000).

3.4 Initial Response

In 1975, the Water Board initiated studies for abatement of risks associated with the site. While the Water Board was determining appropriate site closure activities, heavy rains in 1978 caused the Water Board to authorize a controlled release of 800,000 gallons of wastewater from the site to prevent further waste pond overflow and massive releases. Between 1978 and 1981, the Water Board removed approximately 6.5 MG of liquid wastes and soils contaminated with pesticides from the site. The USEPA and the U.S. Coast Guard helped remove an additional 10 MG of contaminated water in 1980 to prevent a third surface discharge. Also at this time, improvements were made to the surface drainage system (Environ, 2000).

In 1980, the Water Board adopted an interim abatement solution to prevent leaching and washout of the contaminated waste. The interim program was designed to reduce the amount of waste, neutralize its pH, reduce surface flow contamination, and contain, reduce, and treat contaminated groundwater. The program installed a gravel collection system and clay core barrier dam downstream of the site, concrete gutters and gunite channels for surface runoff, a 1-foot kiln dust layer and 2-foot clay cap on top of the disposal site, 14 monitoring wells, 3 extraction wells upstream of barrier dam, 1 extraction well downstream of barrier dam and 3 interceptor wells; graded the site for drainage control; and injected gel into bedrock below the barrier dam (Environ, 2000).

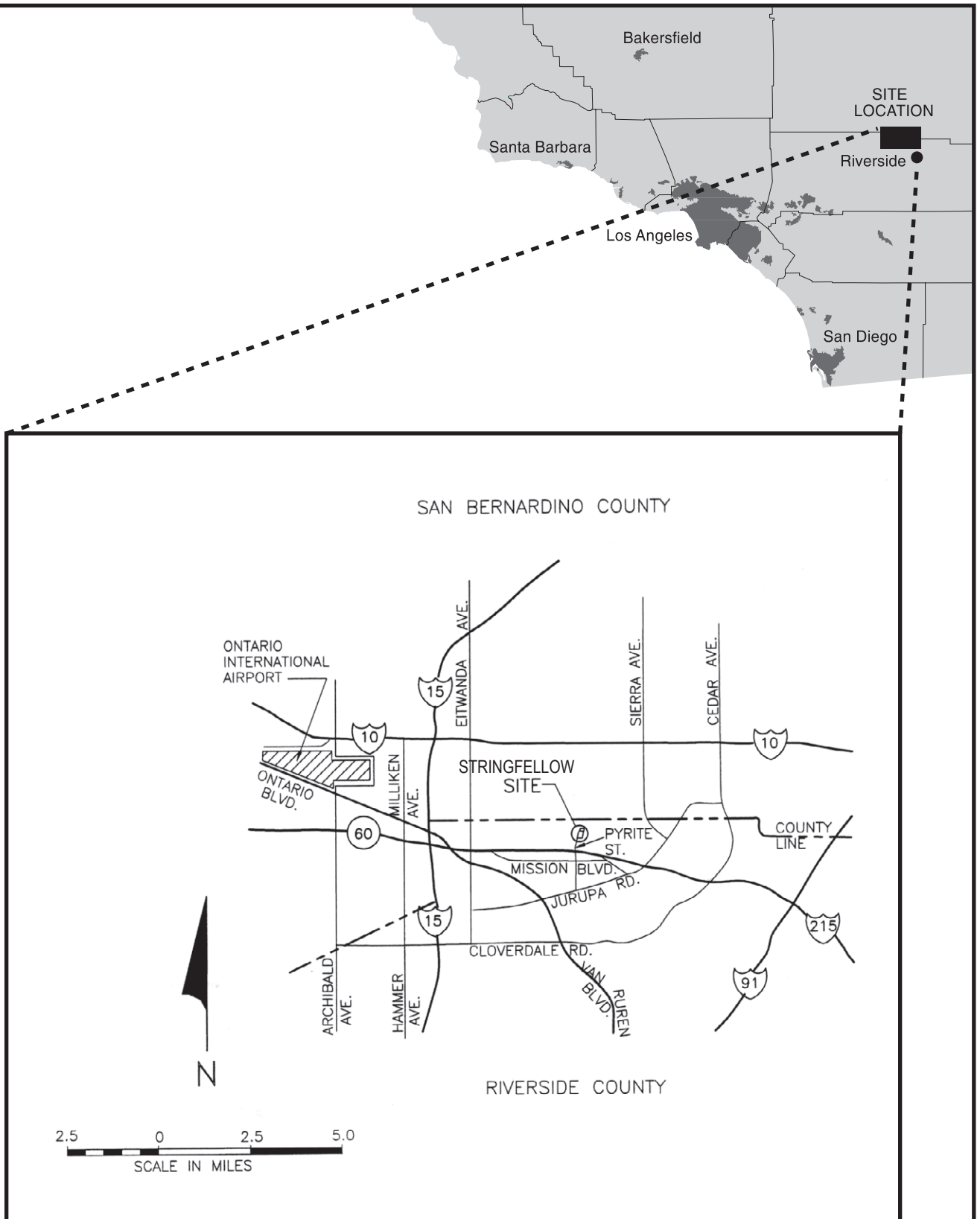
The site was listed by the USEPA on the Interim Priorities List of Hazardous Waste Sites in 1981. The site was placed on the NPL in 1983 (Environ, 2000).

3.5 Basis for Taking Action

Groundwater at the site was found to be contaminated with high concentrations of soluble organic and inorganic contaminants, including, but not limited to, acids, minerals, and heavy metals. Groundwater contamination from the site extends from Zone 1 to the Santa Ana River in Zone 4. The vertical extent of contaminated groundwater in Zone 1 includes the alluvium, weathered bedrock, and the fractures in the unweathered bedrock. Contamination in Zones 2, 3, and 4 may be limited to the alluvium and weathered bedrock, but could potentially migrate to the unweathered bedrock.

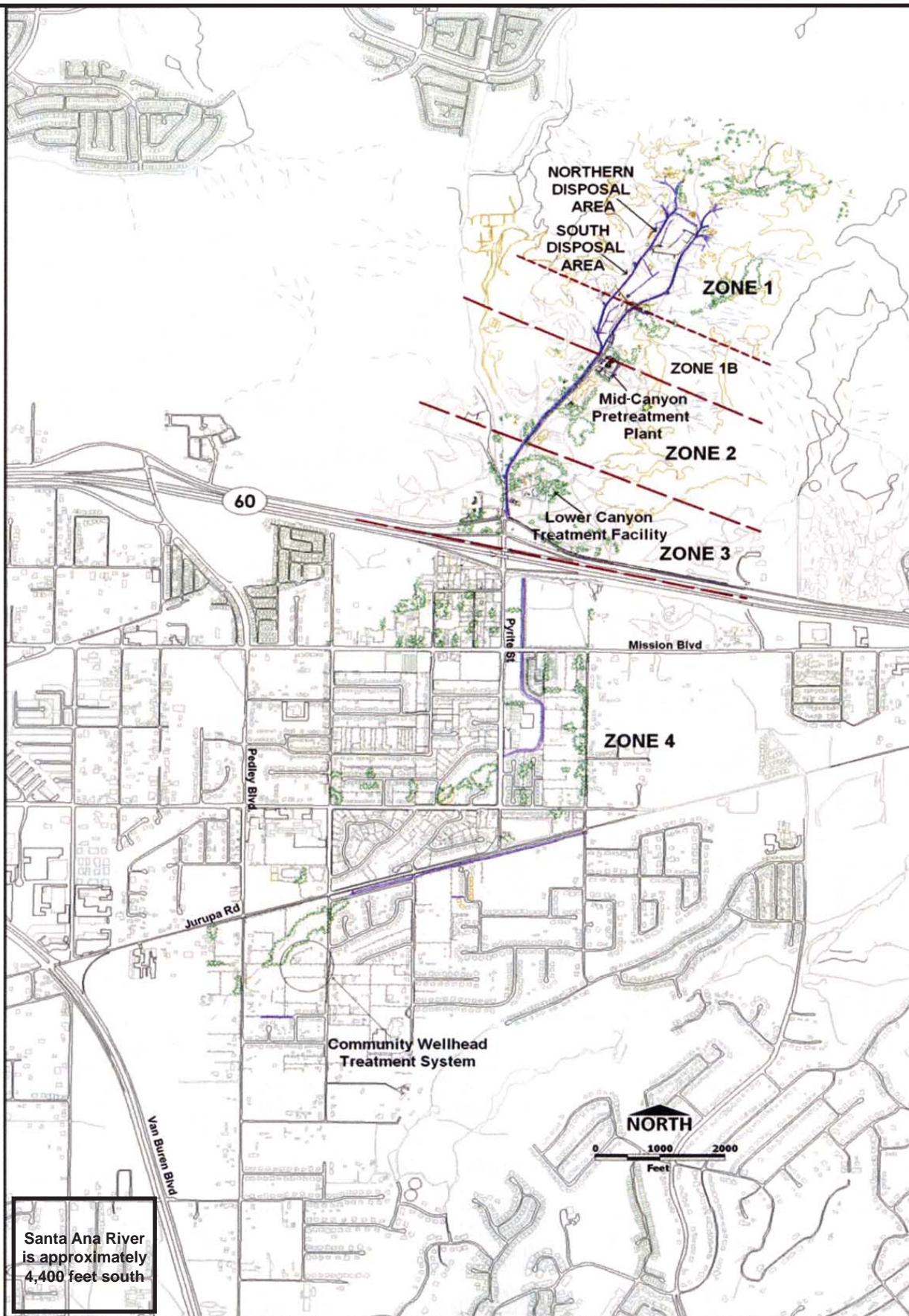
Exposure to the contaminants at the site poses potentially significant human health risks. At the time the first ROD was issued (1983), mean concentrations of at least eight inorganic constituents and nine organic constituents exceeded federal maximum contaminant levels (MCL), secondary MCLs, maximum contaminant level goals, or adjusted ambient water quality criteria: cadmium, chromium, copper, fluoride, iron, manganese, nitrate, zinc, chlorobenzene, chloroform, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethylene, 1,1,2,2,-trichloroethane, tetrachloroethylene, trichloroethylene (TCE), and xylenes (USEPA,

1983). The HHRA quantified potential risks to human health in the event that the contaminated groundwater plume is used as a source of drinking water. The Water Board's Water Quality Control Plan for the Santa Ana River Basin designates groundwater downgradient of the site as having a present or potential beneficial use for municipal supply (Water Board, 1995). Therefore, remedial action was determined to be warranted to mitigate risks to human health and the environment.



Source: Modified from Environ, 2000

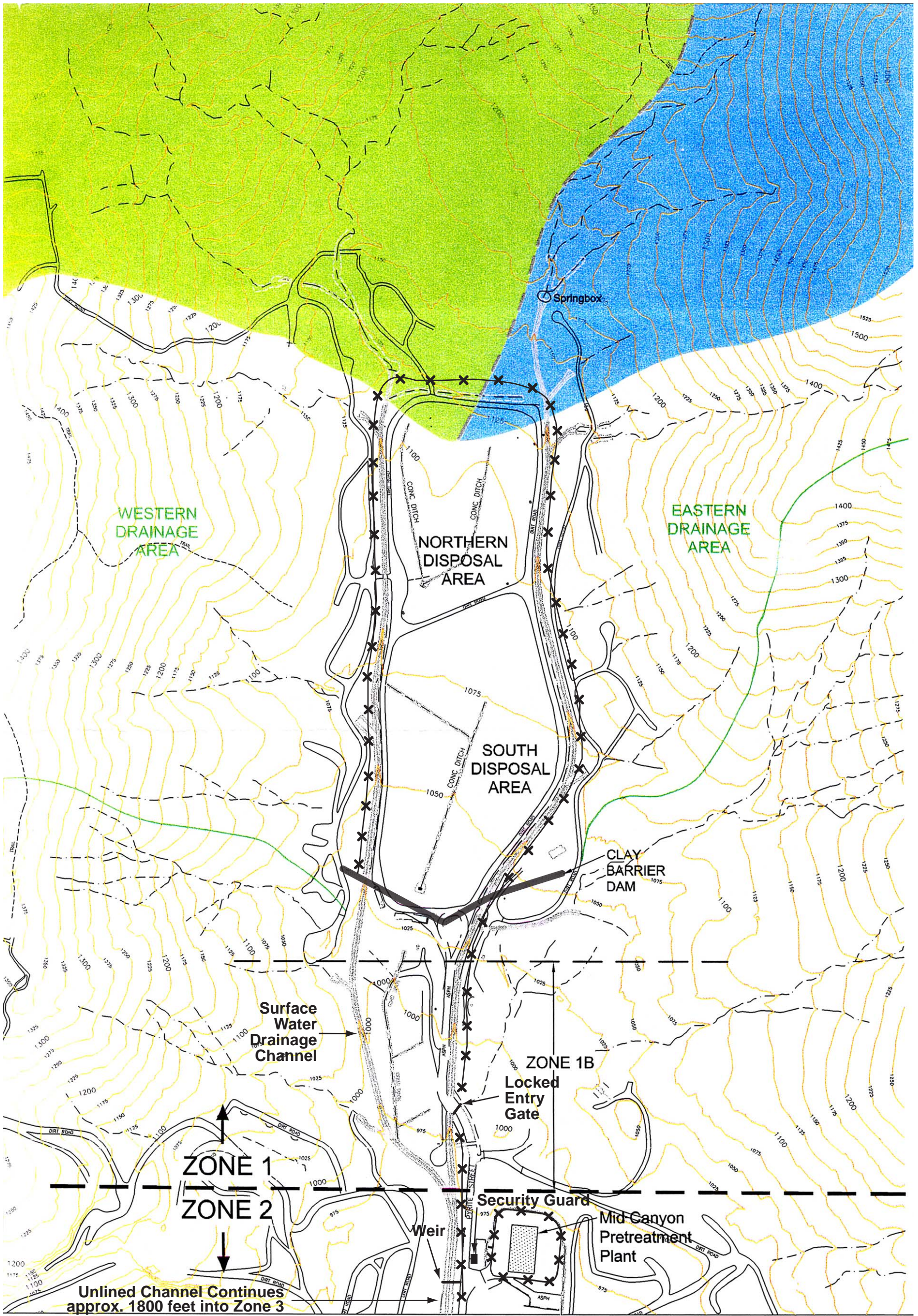
FIGURE 1
SITE LOCATION MAP
 STRINGFELLOW FIVE-YEAR REVIEW REPORT
 GLEN AVON, CA



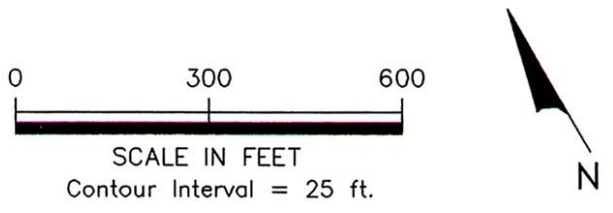
Source: Tetra Tech, Inc., 2004

FIGURE 2
SITE MAP BY ZONE
 STRINGFELLOW FIVE-YEAR REVIEW REPORT
 GLEN AVON, CA

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- 1050 Topographic Surface Contours, Feet Mean Sea Level (MSL)
- Approximate Drainage Area from Northwestern Face of Pyrite Canyon
- Approximate Drainage Area from Mount Jurupa
- X X Approximate Location of Barbed Wire Fence



Source: Modified from Environ, 2000

FIGURE 3
SITE FEATURES IN ZONE 1
STRINGFELLOW FIVE-YEAR REVIEW REPORT
GLEN AVON, CA